MEASURING ALUMINUM & CHLORIDE FROM MLRS EXHAUST PRODUCTS AT THE CAMP SHELBY, MS TRAINING FACILITY

BY

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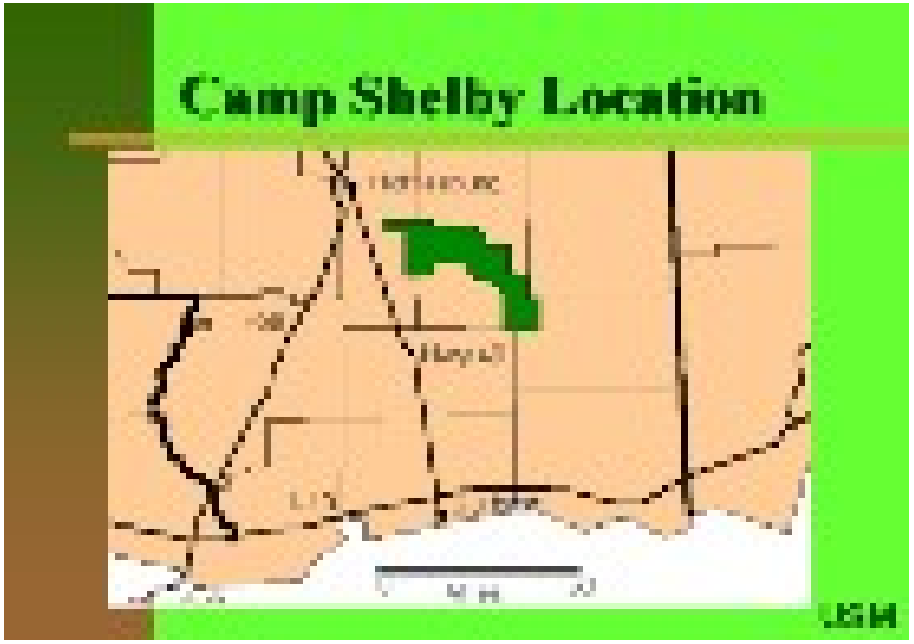


This project fits within the theme of an on-going study being conducted at the Camp Shelby Training Facility which focuses on:

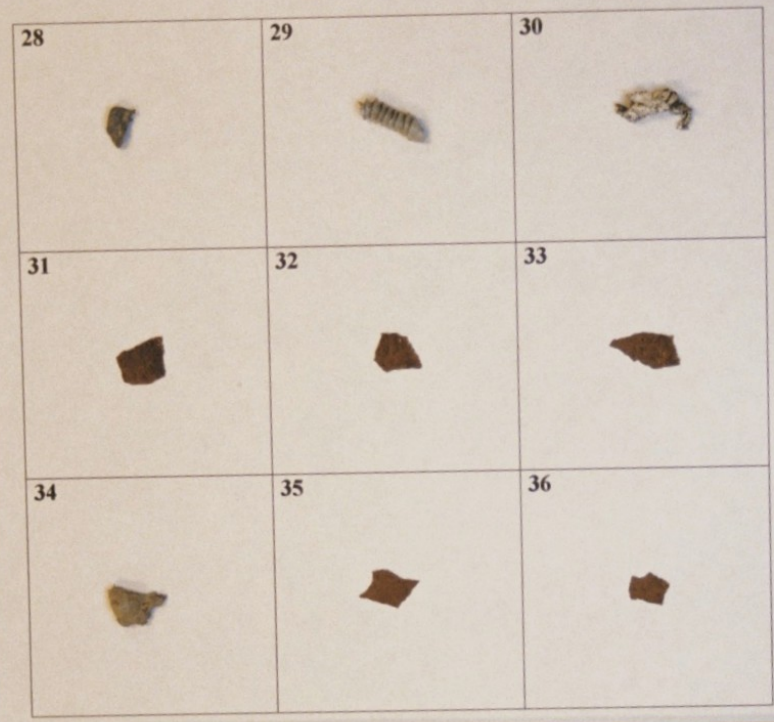
(a) Effects on vegetation,

(b) Effects on proposed, endangered, threatened, and sensitive animal species [PETS],

(c) Effects on water,

(d) Effects on soil mineralogy,

(e) Effects on elemental abundances



Debris

from

MLRS
Firing Point
125

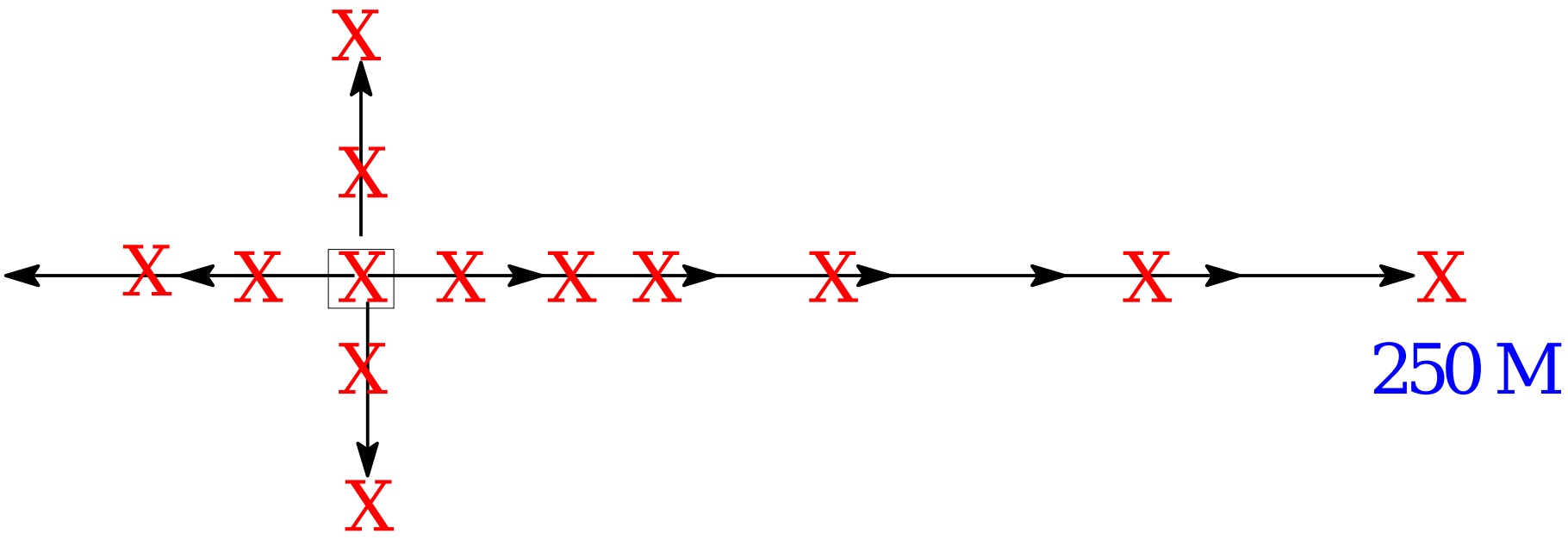
July 6 & 7, 2001

Scale

- Questions.
- 1. Is aluminum and/or chloride from MLRS firing accumulated in:
- (a) Soil, (b) sediments,(c) roots, and/or (d) leaves @ CSTF?
- 2. If so, how much?

- Strategy.
- Accurately measure the abundances of both aluminum and chloride at several locations @ the CSTF prior to (baseline data) and after firing the MLRS at selected sites (which are either)
- (a) At MLRS firing sites, OR
- (b) Far removed from MLRS firing sites
- AND THEN COMPARE RESULTS--
- site-by-site.

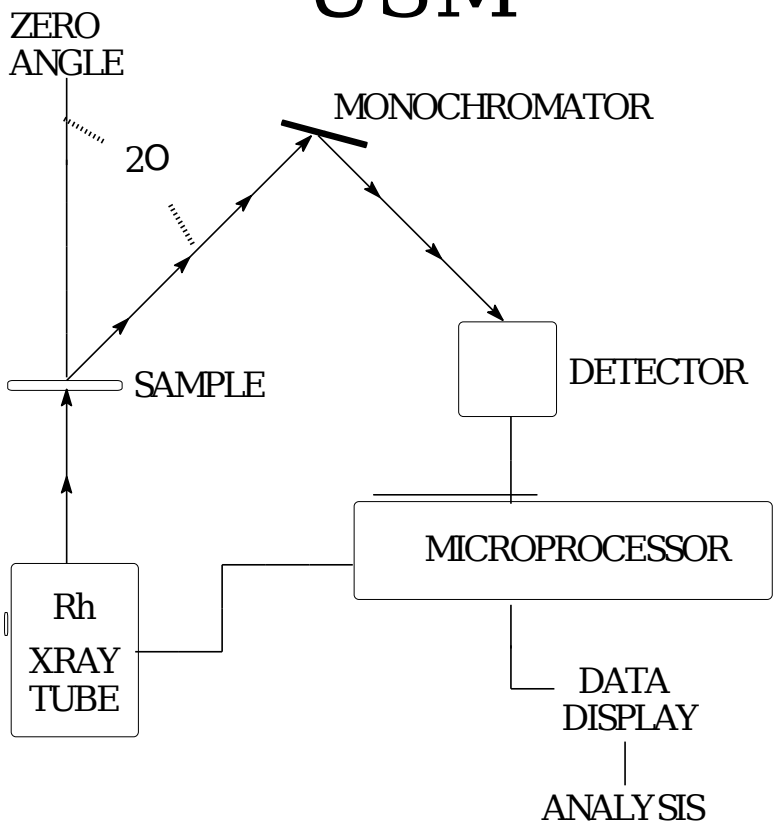
MATRIX OF SAMPLES



- Method for Analysis.
  - Wavelength Dispersive X-ray Fluorescence Spectrometry -- WDXRF.

  - Quite accurate for identifying elements (i.e.,
  - aluminum and chloride as opposed to other (interfering) elements in the samples.
  - Can be made to be quantitative when used with “standards”. Wertz lab has done this!

SCHEMATIC OF WDXRF SPECTROMETER IN WERTZ LAB @ USM



WAVELENGTH DISPERSIVE X-RAY SPECTROMETER IN THE WERTZ LABORATORY AT THE UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG

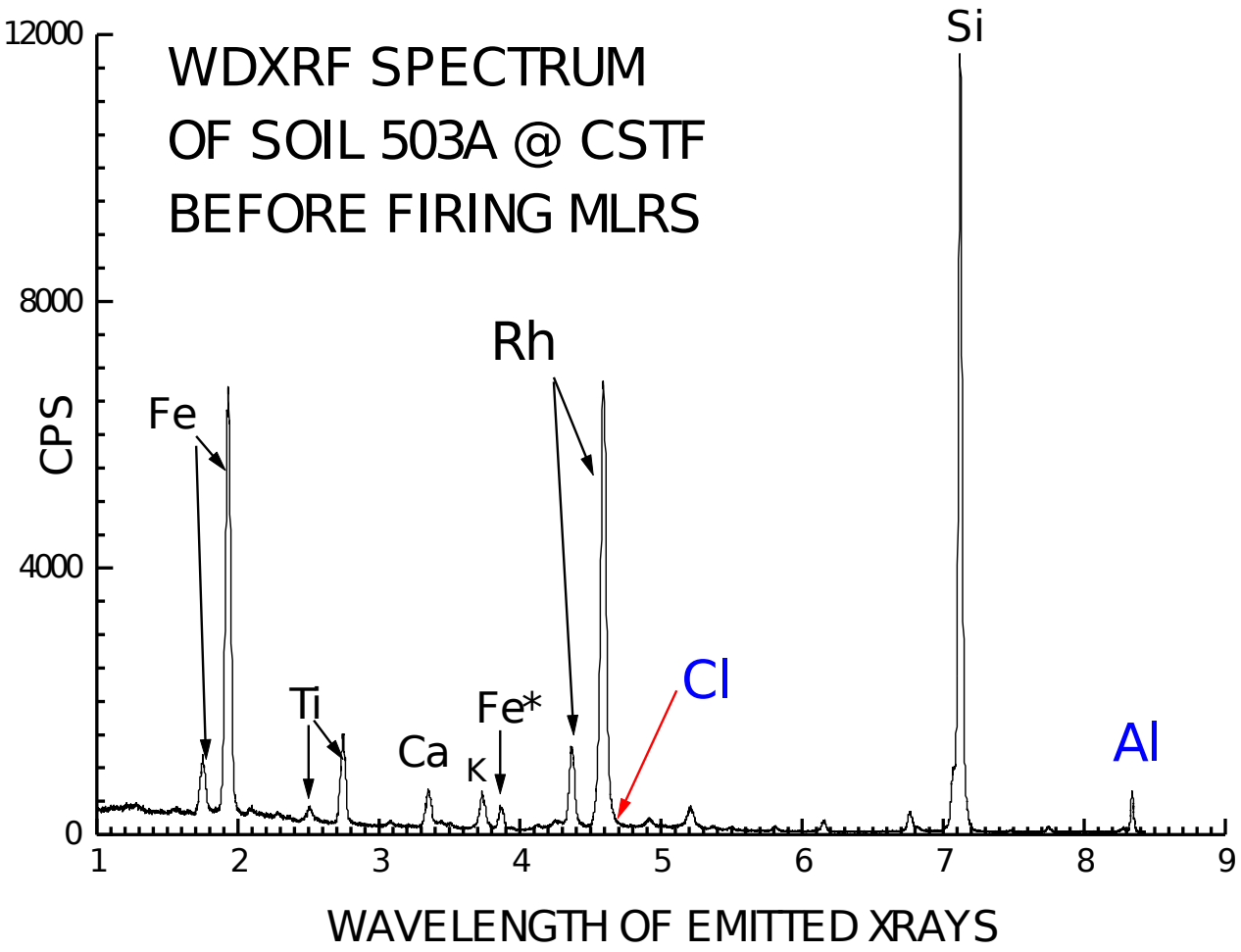
A Brief Physics Lesson

After a sample (soil, roots, etc) has been irradiated, the atoms in that sample emit X Rays. The energies (or wavelengths) of the emitted X Rays depend on the atomic number of the atom in the sample.

Moseley's Law:

$$\lambda = \{Z - \rho\}^{½} / T;$$

where ρ and T are constants.


WDXRF SPECTRUM
OF SOIL 503A @ CSTF
BEFORE FIRING MLRS
12000
8000
4000
0
CPS
Si
Rh
Fe
Ti
Ca
K
Fe*
Cl
Al
1
2
3
4
5
6
7
8
9
WAVELENGTH OF EMITTED XRAYS

WAVELENGTH/ELEMENT CORRELATIONS

λ	Z	Element
1.94 Å	26	Iron*
4.73 Å	17	Chloride
7.13 Å	14	Silicon*
8.34 Å	13	Aluminum

ANALYSIS RESULTS @ FP 503a, CSTF; SOIL ANALYSIS

Distance	Aluminum	Chloride
0 m	49,804 ppm	<LLD
10 m	42,853 ppm	<LLD
20 m	48,319 ppm	<LLD
50 m	53,667 ppm	<LLD
150 m	63,548 ppm	<LLD

ALUMINUM ABUNDANCE IN PPM

- Measure Al Peak Area using computer methods.
- Calculate Analysis Uncertainty by:
- σ = SQRT{Al Peak Area} .
- Al in ppm = Al peak Area x abcor* / Q(Al)
- Uncertainty in Al analysis (in ppm) =
  - σ/Q(Al), so results are also in PPM Al.
  - * Books have been written about abcor.

FP 503A @ CSTF
Comparisons of Aluminum Abundances

DISTANCE	BASE LINE ALUMINUM	+ONE YEAR ALUMINUM
0 m	49,804 ±223	
10 m	42,853 ±207	
20 m	48,319 ±220	
50 m	53,667 ±232	
150 m	63,548 ±252	

8 additional data points @ this site

CONCLUSIONS

- 1. The sampling method is good.
- 2. The WDXRF analysis method is scientifically sound and is giving satisfactory results.
- 3. See us next year to see what the analysis results signify in terms of environmental impact,

PROBLEMS

- TO GET THE MLRS FIRING TEAM TO FIRE FROM THE POINT ALREADY SAMPLED.

- TO FIND THE SAMPLING MATRIX IN YEARS TWO & THREE -- AFTER MLRS FIRING HAS OCCURED

Amanda

Kristi

Megan

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